

Mutagenic Evaluation of Compound FDA 73-53    **Malt Extract** 6/15/75

**F19**

LBI PROJECT #2468

MUTAGENIC EVALUATION OF

COMPOUND FDA 73-53

977051174

MALT EXTRACT

SUBMITTED TO

FOOD & DRUG ADMINISTRATION  
DEPARTMENT OF HEALTH, EDUCATION AND WELFARE  
ROCKVILLE, MARYLAND

SUBMITTED BY

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JUNE 15, 1975



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### EVALUATION SUMMARY

Compound FDA 73-53, Malt Extract, did not exhibit genetic activity in any of the in vitro microbial assays employed in this evaluation.



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DATE: June 15, 1975

SPONSOR: Food and Drug Administration, Contract Number 223-74-2104

SUBJECT: Evaluation of Test Compound 977051174, Malt Extract FDA 73-53

I. OBJECTIVE

The objective of this study was to evaluate the test compound for genetic activity in microbial assays with and without the addition of mammalian metabolic activation preparations.

II. MATERIALS

A. Test Compound

1. Date Received: August, 1974
2. Description: viscous brown syrup

B. Indicator Microorganisms

The following strains of indicator microorganisms were used in the evaluation:

Yeast Strain: Saccharomyces cerevisiae, strain D4

Bacteria Strains: Salmonella typhimurium, strains: TA-1535  
TA-1537  
TA-1538

C. Reaction Mixture

The following reaction mixture was employed in the activation tests:

<u>Component</u>	<u>Final Concentration/ml</u>
1. TPN (sodium salt)	6 $\mu$ M
2. Isocitric acid	49 $\mu$ M
3. Tris buffer, pH 7.4	28 $\mu$ M
4. MgCl <sub>2</sub>	1.7 $\mu$ M
5. Tissue homogenate fraction	72 mg



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#### D. Tissue Homogenates and Supernatants

The tissue homogenates and 9,000 x g supernatants were prepared from tissues of the following mammalian species: Mouse-ICR random bred adult males; rat-Sprague-Dawley adult males; and primate-Macaca mulatta adult males.

#### E. Positive Control Compounds

Table 1 lists chemicals for positive controls in the direct and activation assays.

TABLE 1  
POSITIVE CONTROLS USED IN DIRECT AND ACTIVATION ASSAYS

<u>Assay</u>	<u>Chemical</u> <sup>a</sup>	<u>Solvent</u>	<u>Probable Mutagenic Specificity</u>
Nonactivation	Ethyl methanesulfonate	Water or saline	BPS <sup>b</sup>
	2-Nitrofluorene	Dimethylsulfoxide <sup>c</sup>	FS <sup>b</sup>
	Quinacrine mustard	Water or saline	FS <sup>b</sup>
Activation	Dimethylnitrosamine	Water or saline	BPS <sup>b</sup>
	2-Acetylaminofluorene	Dimethylsulfoxide <sup>c</sup>	FS <sup>b</sup>

<sup>a</sup> Concentrations given in the Results Section

<sup>b</sup> BPS = base-pair substitution; FS = frameshift

<sup>c</sup> Previously shown to be non-mutagenic

### III. METHODS

#### A. Toxicity

The solubility, toxicity and doses for all chemicals were determined prior to screening.

Each chemical was tested for survival against the specific indicator strains over a range of doses to determine the 50% survival dose. Bacteria were tested in phosphate buffer, pH 7.4, for one hour at 37°C on a shaker. Yeasts were tested in phosphate buffer, pH 7.4, for four hours at 30°C on a shaker. The 50% survival curve and the 1/4 and 1/2 50% doses calculated.

If no toxicity was obtained for a chemical with a given strain, then a maximum dose of 5% (w/v) was used against the strain.

Unless otherwise specified, the doses calculated for the tests in buffer were applied to the activation tests. The solubility of the test chemical under treatment conditions is stated in the Results Section.



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## B. Plate Tests

In the nonactivation procedure, approximately  $10^9$  cells of a log phase culture of the bacterial indicator strains were spread over the surface of a minimal plate, and a measured amount of the test chemical was placed in the center of the test plate. In activation tests, the test chemical was added to the cells, and an aliquot of the mixture was spread on the surface of the test plate. The reaction mixture (0.1 ml) plus tissue extract was then spotted on the surface of the plate. Positive and solvent controls were included. All plates were incubated at 37°C for four days and then scored. Each compound (Test, Positive Control and Solvent Control) was done in duplicate. Concentrations of the positive control compounds are listed in the Results Section.

## C. Suspension Tests

### 1. Nonactivation

Log-phase bacteria and stationary-phase yeast cultures of the indicator organisms were grown in complete broth, washed and resuspended in 0.9% saline to densities of  $1 \times 10^9$  cells/ml and  $5 \times 10^7$  cells/ml, respectively. This constituted the working stock for tests of a group of test chemicals and their respective controls. Tests were conducted in plastic tissue culture plates. Cells plus appropriate volume(s) of the test chemical were added to the wells to give a final volume of 1.5 ml. The solvent replaced the test chemical in the negative controls. Treatment was at 30°C for four hours for yeast tests and at 37°C for one hour for bacterial tests. All flasks were shaken during treatment. Following treatment, the plates were set on ice. Aliquots of cells were removed, diluted in sterile saline (4°C) and plated on the appropriate complete media. Undiluted samples from flasks containing the bacteria were plated on minimal selective medium in reversion experiments. Samples from a  $10^{-1}$  dilution of treated cells were plated on the selected media for enumeration of gene conversion with strain D4. Bacterial plates were scored after incubation for 48 hours at 37°C. The yeast plates were incubated at 30°C for 3-5 days before scoring.

### 2. Activation

Bacteria and yeast cells were grown and prepared as described in the nonactivation tests. Measured amounts of the test and control chemicals plus 0.25 ml of the stock-cell suspension were added to wells of the Linbro plate containing the appropriate tissue fraction and reaction mixture. All flasks (bacteria and yeast) were incubated at 37°C in an oxygen atmosphere with shaking. The treatment times as well as the dilutions, plating procedures and scoring of the plates were the same as described for nonactivation tests.



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D. Preparation of Tissue Homogenates and 9,000 x g Cell Fractions

Male animals (sufficient to provide the necessary quantities of tissues) were killed by cranial blow, decapitated and bled. Organs were immediately dissected from the animal using aseptic techniques and placed in ice-cold 0.25 M sucrose buffered with Tris at pH of 7.4. Upon collection of the desired quantity of organs, they were washed twice with fresh buffered sucrose and completely homogenized with a motor-driven homogenizing unit at 4°C. The whole organ homogenate obtained from this step was divided into two samples. One sample was frozen at -80°C and the other was centrifuged for 20 minutes at 9,000 x g in a refrigerated centrifuge. The supernatant from the centrifuged sample was retained and frozen at -80°C. These two frozen samples were used for the activation studies.

E. Data Recording and Reporting

Following the specified incubation periods all population plates were scored by an automatic colony counter and the results from each plate of a set were recorded, in ink, on data processing forms. All minimal or other types of selective media plates were hand scored and the results recorded along with the respective population data. Other relevant experimental data were recorded on experimental definition forms. For bacteria strains the number of colonies recorded from either the population or selective plates represents that number in 1 ml of test suspension plated. The numbers recorded for the yeast strain D4 represent the number in 0.5 ml of test suspension plated. The data were then processed and printed from a computer program.



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IV. RESULTS SECTION

A. Solubility Properties of the Test Compound

1. Name or code designation of the test compound: 977051174 Malt Extract
2. Test solvent: Saline
3. Solubility of the test compound under treatment conditions:  
Soluble under treatment conditions
4. Additional comments: Viscous brown syrup

B. Toxicity and Dosage Determinations for the Test Compound

1. Test date for toxicity determination: April 11, 1975
2. The 50% survival level was determined for bacteria and yeast indicator organisms by conducting survival curves with the test compound at the following concentrations:

Percent Concentration (w/v or v/v)

10.0  
1.0  
0.1  
0.01  
0.001

3. Concentrations of the test compound used in the mutagenicity tests:

Dose	<u>Percent Concentration</u>	
	Bacteria	Yeast
1/4 50% Survival	2.5	2.5
1/2 50% Survival	5.0	5.0
50% Survival	10.0	10.0
Plate Tests	2.5	--



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V. SUMMARY OF TEST RESULTS

Plate Tests

- A. Name or code designation of the test compound: 977051174
- B. Test date: April 21, 1975
- C. Concentration of the test compound: 2.5%

Test	Species	Tissue	REVERTANTS/PLATE					
			TA-1535		TA-1537		TA-1538	
			<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>
1. <u>Non-activation</u>								
Solvent Control	---	---	3	4	22	33	7	11
Positive Control <sup>a</sup>	---	---	>10 <sup>5</sup>	>10 <sup>5</sup>	138	133	146	138
Test Compound	---	---	11	9	23	27	23	22
2. <u>Activation</u>								
Negative Control	---	---	6	4	27	23	7	14
Solvent Control	---	---	10	12	36	43	16	18
Reaction Mixture Control	---	---	9	7	36	39	19	23
Positive Control <sup>b</sup>	Mouse	Liver	>10 <sup>3</sup>	>10 <sup>3</sup>	96	93	333	317
Positive Control		Lung	9	7	33	33	21	26
Positive Control		Testes	7	2	37	32	18	11
Positive Control	Rat	Liver	>10 <sup>3</sup>	>10 <sup>3</sup>	84	80	314	317
Positive Control		Lung	11	6	32	35	15	18
Positive Control		Testes	6	5	24	43	20	9
Positive Control	Monkey	Liver	>10 <sup>3</sup>	>10 <sup>3</sup>	97	93	111	155
Positive Control		Lung	8	5	32	38	13	15
Positive Control		Testes	8	2	28	33	12	8
Test Compound	Mouse	Liver	4	7	39	40	16	14
Test Compound		Lung	5	2	24	26	12	8
Test Compound		Testes	6	7	28	32	15	23
Test Compound	Rat	Liver	6	9	36	39	16	14
Test Compound		Lung	5	2	18	26	14	13
Test Compound		Testes	4	8	29	19	17	21
Test Compound	Monkey	Liver	4	11	34	39	16	14
Test Compound		Lung	3	2	28	28	15	18
Test Compound		Testes	5	4	29	22	13	18

a TA-1535 EMS 10 µl/plate  
 TA-1537 QM 20 µg/plate  
 TA-1538 NF 100 µg/plate

b TA-1535 DMNA 50 µM/plate  
 TA-1537 AAF 100 µg/plate  
 TA-1538 AAF 100 µg/plate



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## DATA TABLE TERMS AND ABBREVIATIONS

ABBREVIATION OR TERM	DEFINITION OR EXPLANATION
COMPOUND	Client designated compound number appears in this column.
TEST CODES	<p> NAN = Nonactivation: Solvent Control  NAP = Nonactivation: Positive Control  NA1 = Nonactivation: Test Compound Dose 1  NA2, etc. = Reflects the other dose level(s) </p> <p> A+C = Negative Chemical Control  A-C = Activation: Solvent Control  ACP = Activation: Positive Control  ACT = Activation: Test Compound  A+T = Activation: Tissue Control </p> <p> LI = Liver Tissue Activation Fraction  LU = Lung Tissue Activation Fraction  KI = Kidney Tissue Activation Fraction  TE = Testes Tissue Activation Fraction  1,2, etc. = Dose Levels </p>
CONCENTRATION	<p>All test compound dose levels are expressed as a whole number followed by an exponent (negative) identified by the appropriate units.</p> <p>Example: 0025-2PCT = 0.25 percent concentration</p>
POPU	Total number of viable cells in the plating sample raised to some exponent printed directly below the abbreviation (i.e., EP + 6 = $\times 10^6$ ).
MUT 1	Total number of mutants or convertants obtained from the sample plated raised to some exponent printed directly below the abbreviation (i.e., EP + 0 = $10^0$ ). For strain D4, MUT 1 represents the number of ADE+ convertants.
MUT 2	Only used for strain D4 and represents the number of TRY+ convertants in the plated sample.
FREQ 1	The calculated mutation or gene conversion frequency times the negative exponent written directly below. For strain D4, FREQ 1 represents the ADE+ value.
FREQ 2	Only used for strain D4 and represents the TRY+ conversion frequency.
CONTAM	Presence of contamination on any plates.



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# DATA TABLE TERMS AND ABBREVIATIONS (continued)

ABBREVIATION OR TERM	DEFINITION OR EXPLANATION
AAF	2-Acetylaminofluorene
DMSO	Dimethylsulfoxide
DMN	Dimethylnitrosamine
EMS	Ethyl Methanesulfonate
QM	Quinacrine Mustard
NF	Nitrofluorene
SPECIES	Animal Strains
SPRDAW	Sprague Dawley Rats
ICRFLO	Flow ICR Random Bred Mice
RHESUS	Rhesus Monkey ( <u>Macaca mulatta</u> )
MIXEDB	Dog, Mixed Breed
NEWZEA	New Zealand White Rabbit



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LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 07/08/75

SPECIES / COMPOUND 977051174

TEST	ORG	TA1537 HIS EX-8	TA1535 HIS EX-8	TA1538 HIS EX-8	000004 ADE EX-5	000004 TRY EX-5
NAN		5.32	12.94	1.24	1.89	1.48
NAP		1764.20	771.32	922.93	129.05	155.87
NA1		5.05	4.61	2.90	1.58	0.68
NA2		4.96	3.50	3.78	0.35	0.18



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LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 07/08/75

SPECIES ICRFLO/MOUSE

COMPOUND 977051174

TEST	ORG	TA1537 HIS EX-8	TA1538 HIS EX-8	TA1535 HIS EX-8	000004 ADE EX-5	000004 TRY EX-5
ACT	A+C	20.45	6.88	3.23	2.25	1.59
ACT	A+T	35.90	6.31	7.69	3.25	1.59
ACT	A-C	12.22	2.93	3.73	0.96	0.17
ACT	PLI	45.07	15.26	<b>5496.88</b>	7.59	6.16
ACT	PLII	20.50	4.48	4.79	2.42	2.60
ACT	PTE	28.79	2.33	9.15	3.81	2.06
ACT	LI1	9.84	6.07	3.40	1.85	2.52
ACT	LI2	8.94	5.12	1.60	2.86	3.12
ACT	LU1	10.21	2.35	0.84	2.68	1.79
ACT	LU2	10.67	2.56	1.85	2.47	2.12
ACT	TE1	9.23	1.83	7.72	1.54	1.90
ACT	TE2	7.76	3.41	3.28	3.34	1.60



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LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 07/08/75

SPECIES SPRDAW/RAT

COMPOUND 977051174

TEST	ORG	TA1535 HIS EX-8	TA1537 HIS EX-8	TA1538 HIS EX-8	000004 ADE EX-5	000004 TRY EX-5
ACT	A+C	4.48	10.86	4.75	1.37	1.03
ACT	A+T	2.48	10.31	6.57	>4.61	7.21
ACT	A-C	5.52	8.87	9.05	0.49	0.49
ACT	PLI	333.15	17.19	20.33	1.90	1.27
ACT	PLU	6.11	14.09	8.76	2.38	0.59
ACT	PTE	8.60	11.40	6.77	3.14	1.73
ACT	LI1	8.15	7.02	4.78	3.16	2.74
ACT	LI2	3.25	7.59	5.60	3.35	3.35
ACT	LU1	7.35	11.19	7.76	2.41	1.85
ACT	LU2	4.48	8.43	6.95	2.90	1.88
ACT	TE1	7.46	19.35 ✓	9.11	1.90	0.95
ACT	TE2	9.93	10.11	10.18	2.48	3.51



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LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
REPORT EXR34

COMPOUND FREQUENCY SUMMARY REPORT 07/08/75

SPECIES RHESUS/MONKEY

COMPOUND 977051174

TEST	ORG	TA1537 HIS EX-8	TA1535 HIS EX-8	TA1538 HIS EX-8	000004 ADE EX-5	000004 TRY EX-5
ACT	A+C	6.36	4.50	10.43	1.82	1.82
ACT	A+T	3.92	5.62	5.80	2.59	2.73
ACT	A-C	5.63	7.72	2.70	2.16	1.80
ACT	PLI	10.56	1194.98	54.55	6.38	3.75
ACT	PLU	5.60	5.81	5.22	2.40	2.64
ACT	PTE	8.26	3.99	6.61	5.41	2.30
ACT	LI1	5.30	5.05	3.62	3.16	3.79
ACT	LI2	5.58	4.67	7.96	1.98	2.64
ACT	LU1	4.44	6.93	3.49	1.78	2.23
ACT	LU2	7.73	4.72	3.01	2.38	1.40
ACT	TE1	5.24	5.63	4.80	2.15	2.62
ACT	TE2	4.55	3.05	3.46	5.82	1.64



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VI. INTERPRETATION OF RESULTS AND CONCLUSIONS

Compound 977051174, Malt Extract, was tested for mutagenic activity in a series of in vitro microbial assays with and without metabolic activation. The following results were obtained:

A. Salmonella typhimurium

1. Plate tests

At a concentration of 2.5%, 977051174, was not mutagenic for any of the bacterial indicator organisms in either direct or activation plate assays.

2. Nonactivation suspension tests

The results of these tests were negative.

3. Activation suspension tests

The results of these tests were negative.

B. Saccharomyces cerevisiae

1. Nonactivation suspension tests

The results of these tests were negative.

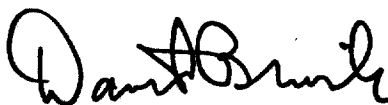
2. Activation suspension tests

The results of these tests were negative.

C. Conclusions

The test compound, Malt Extract, did not exhibit genetic activity in any of the assays employed in this evaluation.

Submitted by:



David Brusick, Ph.D.  
Director, of Genetics



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**APPENDIX**  
**Tabulation of Data**



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104  
EXPERIMENT 509802 DETECTOR TA1535 SPECIES PROJECT 02468  
/

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPUL EP+6	MUT1 EP+0	FRF01 EP-8	CONTAM
	NAN		SALINE	0487	0063	12.94	0
	NAP		FMS 0.002 %	0537	4142	771.32	0
977051174	NA1		0005-0 PCT.	0760	0035	4.61	2
977051174	NA2		0025-1 PCT.	0799	0028	3.50	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

		CONTRACT 22374-2104		PROJECT 02468		DATE - 07/08/75	
EXPERIMENT 511301		DETECTOR TA1537		SPECIES		/	
COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	NAN		SALINE	0601	0032	5.32	0
	NAP		QM 1.0 UG/ML	0257	4534	1764.20	0
977051174	NA1		0005-0 PCT.	0475	0024	5.05	2
977051174	NA2		0025-1 PCT.	0484	0024	4.96	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104  
EXPERIMENT 509803 DETECTOR TA1538 SPECIES PROJECT 02468  
/

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POP1 EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	NAN		DMSO	0563	0007	1.24	0
	NAP		NF 125 UG-ML	0567	5233	922.93	0
977051174	NA1		0005-0 PCT.	0759	0022	2.90	2
977051174	NA2		0025-1 PCT.	0873	0033	3.78	2



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104  
EXPERIMENT 514705 DETECTOR 000004 SPECIES / PROJECT 02468  
DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+4	MUT1 EP+1	MUT2 EP+1	FREQ1 EP-5	FREQ2 EP-5	CONTAM
	NAN		SALINE	0741	0014	0011	1.89	1.48	0
	NAP		FMS 1.0 %	0179	0231	0279	129.05	155.87	0
977051174	NA1		0005-0 PCT.	0442	0007	0003	1.58	0.68	0
977051174	NA2		0025-1 PCT.	0564	0002	0001	0.35	0.18	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 509401 DETECTOR TA1535 SPECIES ICRFLO/MOUSE DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPJ EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	A+C		DMN 50 UM/ML	0650	0021	3.23	0
	A+T		***NO MATCH***	0156	0012	7.69	0
	A-C		SALINE	0670	0025	3.73	1
	ACP	LI	DMN 50 UM/ML	0096	5277	5496.88	0
	ACP	LU	DMN 50 UM/ML	0313	0015	4.79	0
	ACP	TE	DMN 50 UM/ML	0153	0014	9.15	0
977051174	ACT	LI1	0005-0 PCT.	0500	0017	3.40	0
977051174	ACT	LI2	0025-1 PCT.	0437	0007	1.60	2
977051174	ACT	LU1	0005-0 PCT.	0596	0005	0.84	2
977051174	ACT	LU2	0025-1 PCT.	0486	0009	1.85	2
977051174	ACT	TE1	0005-0 PCT.	0544	0042	7.72	0
977051174	ACT	TE2	0025-1 PCT.	0396	0013	3.28	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 517602 DETECTOR TA1537 SPECIES ICRFLD/MOUSE

DATE -- 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPUL EP+6	MUT1 EP+0	FRF01 EP-8	CONTAM
	A+C		AAF 800 UG/ML	0308	0063	20.45	0
	A+T		***NO MATCH***	0078	0028	35.90	1
	A-C		DMSO	0483	0059	12.22	0
	ACP	LI	AAF 800 UG/ML	0071	0032	45.07	1
	ACP	LU	AAF 800 UG/ML	0161	0033	20.50	0
	ACP	TE	AAF 800 UG/ML	0198	0057	28.79	0
977051174	ACT	LI1	0005-0 PCT.	0823	0081	9.84	0
977051174	ACT	LI2	0025-1 PCT.	0850	0076	8.94	0
977051174	ACT	LU1	0005-0 PCT.	0754	0077	10.21	0
977051174	ACT	LU2	0025-1 PCT.	0450	0048	10.67	2
977051174	ACT	TE1	0005-0 PCT.	0607	0056	9.23	0
977051174	ACT	TE2	0025-1 PCT.	0490	0038	7.76	1





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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 509701 DETECTOR TA1538 SPECIES ICRFLD/MOUSE

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	A+C		AAF 800 UG/ML	0858	0059	6.88	0
	A+T		***NO MATCH***	0666	0042	6.31	0
	A-C		DMSO	0819	0024	2.93	0
	ACP	LI	AAF 800 UG/ML	0675	0103	15.26	0
	ACP	LU	AAF 800 UG/ML	1026	0046	4.48	2
	ACP	TE	AAF 800 UG/ML	0945	0022	2.33	0
977051174	ACT	LI1	0005-0 PCT.	0478	0029	6.07	0
977051174	ACT	LI2	0025-1 PCT.	0664	0034	5.12	0
977051174	ACT	LU1	0005-0 PCT.	0638	0015	2.35	2
977051174	ACT	LU2	0025-1 PCT.	0780	0020	2.56	2
977051174	ACT	TE1	0005-0 PCT.	0711	0013	1.83	0
977051174	ACT	TE2	0025-1 PCT.	0734	0025	3.41	0



BIONETICS

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 512601 DETECTOR 0000D4 SPECIES ICRFLD/MOUSE DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPUI EP+4	MUT1 EP+1	MUT2 EP+1	FREQ1 EP-5	FREQ2 EP-5	CONTAM
	A+C		DMN 90 UM/ML	0755	0017	0012	2.25	1.59	0
	A+T		***NO MATCH***	1260	0041	0020	3.25	1.59	6
	A-C		SALINE	1145	0011	0002	0.96	0.17	0
	ACP	LI	DMN 90 UM/ML	0909	0069	0056	7.59	6.16	6
	ACP	LU	DMN 90 UM/ML	1117	0027	0029	2.42	2.60	0
	ACP	TE	DMN 90 UM/ML	0970	0037	0020	3.81	2.06	6
977051174	ACT	LI1	0005-0 PCT.	0755	0014	0019	1.85	2.52	4
977051174	ACT	LI2	0025-1 PCT.	0770	0022	0024	2.86	3.12	2
977051174	ACT	LU1	0005-0 PCT.	0895	0024	0016	2.68	1.79	1
977051174	ACT	LU2	0025-1 PCT.	0849	0021	0018	2.47	2.12	1
977051174	ACT	TE1	0005-0 PCT.	0844	0013	0016	1.54	1.90	2
977051174	ACT	TE2	0025-1 PCT.	0689	0023	0011	3.34	1.60	6



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 510801 DETECTOR TA1535 SPECIES SPRDAW/RAT

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	A+C		DMN 50 UM/ML	0692	0031	4.48	0
	A+T		***NO MATCH***	0483	0012	2.48	3
	A-C		SALINE	0725	0040	5.52	0
	ACP	LI	DMN 50 UM/ML	0368	1226	333.15	1
	ACP	LU	DMN 50 UM/ML	0311	0019	6.11	0
	ACP	TE	DMN 50 UM/ML	0349	0030	8.60	0
977051174	ACT	LI1	0005-0 PCT.	0552	0045	8.15	3
977051174	ACT	LI2	0025-1 PCT.	0553	0018	3.25	2
977051174	ACT	LU1	0005-0 PCT.	0517	0038	7.35	0
977051174	ACT	LU2	0025-1 PCT.	0536	0024	4.48	0
977051174	ACT	TE1	0005-0 PCT.	0469	0035	7.46	0
977051174	ACT	TE2	0025-1 PCT.	0614	0061	9.93	2



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 511501 DETECTOR TA1537 SPECIES SPRDAW/RAT

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POP EP+6	MUT1 EP+0	FREQ EP-8	CONTAM
	A+C		AAF 800 UG/ML	0663	0072	10.86	0
	A+T		***NO MATCH***	0446	0046	10.31	0
	A-C		DMSO	0688	0061	8.87	0
	ACP	LI	AAF 800 UG/ML	0512	0088	17.19	2
	ACP	LU	AAF 800 UG/ML	0589	0083	14.09	0
	ACP	TE	AAF 800 UG/ML	0544	0062	11.40	0
977051174	ACT	LI1	0005-0 PCT.	0712	0050	7.02	2
977051174	ACT	LI2	0025-1 PCT.	0632	0048	7.59	2
977051174	ACT	LU1	0005-0 PCT.	0590	0066	11.19	0
977051174	ACT	LU2	0025-1 PCT.	0617	0052	8.43	2
977051174	ACT	TE1	0005-0 PCT.	0465	0090	19.35	0
977051174	ACT	TE2	0025-1 PCT.	0613	0062	10.11	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 511801 DETECTOR TA1538 SPECIES SPRDAW/RAT

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+6	MUT1 EP+0	FREQ1 EP-R	CONTAM
	A+C		AAF 800 UG/ML	0926	0044	4.75	0
	A+T		***NO MATCH***	0792	0052	6.57	0
	A-C		DMSO	0707	0064	9.05	0
	ACP	LI	AAF 800 UG/ML	0718	0146	20.33	2
	ACP	LU	AAF 800 UG/ML	0833	0073	8.76	0
	ACP	TE	AAF 800 UG/ML	0886	0060	6.77	2
977051174	ACT	LI1	0005-0 PCT.	0648	0031	4.78	2
977051174	ACT	LI2	0025-1 PCT.	0625	0035	5.60	0
977051174	ACT	LU1	0005-0 PCT.	0670	0052	7.76	0
977051174	ACT	LU2	0025-1 PCT.	0834	0058	6.95	0
977051174	ACT	TE1	0005-0 PCT.	0571	0052	9.11	0
977051174	ACT	TE2	0025-1 PCT.	0717	0073	10.18	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 515001 DETECTOR 000004 SPECIES SPRDAW/RAT DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+4	MUT1 EP+1	MUT2 EP+1	FREQ1 EP-5	FREQ2 EP-5	CONTAM
	A-C		SALINE	0610	0003	0003	0.49	0.49	0
977051174	ACT	LI1	0005-0 PCT.	0475	0015	0013	3.16	2.74	0
977051174	ACT	LI2	0025-1 PCT.	0568	0019	0019	3.35	3.35	0
977051174	ACT	LU1	0005-0 PCT.	0540	0013	0010	2.41	1.85	0
977051174	ACT	LU2	0025-1 PCT.	0586	0017	0011	2.90	1.88	0
977051174	ACT	TE1	0005-0 PCT.	0525	0010	0005	1.90	0.95	0
977051174	ACT	TE2	0025-1 PCT.	0484	0012	0017	2.48	3.51	0
	A+C		DMN 90 UM/ML	0584	0008	0006	1.37	1.03	2
	A+T			0499	0023	0036	4.61	7.21	6
ACP	LI		DMN 90 UM/ML	0473	0009	0006	1.90	1.27	6
ACP	LU		DMN 90 UM/ML	0505	0012	0003	2.38	0.59	2
ACP	TE		DMN 90 UM/ML	0637	0020	0011	3.14	1.73	0



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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 509901 DETECTOR TA1535 SPECIES RHESUS/MONKEY DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POP EP+6	MUT1 EP+0	FREQ EP-8	CONTAM
	A+C		DMN 50 UM/ML	0756	0034	4.50	0
	A+T		***NO MATCH***	0534	0030	5.62	0
	A-C		SALINE	0479	0037	7.72	1
	ACP	LI	DMN 50 UM/ML	0458	5473	1194.98	0
	ACP	LU	DMN 50 UM/ML	0551	0032	5.81	0
	ACP	TE	DMN 50 UM/ML	0426	0017	3.99	2
977051174	ACT	LI1	0005-0 PCT.	0673	0034	5.05	0
977051174	ACT	LI2	0025-1 PCT.	0600	0028	4.67	0
977051174	ACT	LU1	0005-0 PCT.	0635	0044	6.93	0
977051174	ACT	LU2	0025-1 PCT.	0593	0028	4.72	2
977051174	ACT	TE1	0005-0 PCT.	0497	0028	5.63	2
977051174	ACT	TE2	0025-1 PCT.	0721	0022	3.05	2



BIONETICS

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 511901 DETECTOR TA1537 SPECIES RHESUS/MONKEY DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPUL EP+6	MUT1 EP+0	FREQ1 EP-8	CONTAM
	A+C		AAF 800 UG/ML	0692	0044	6.36	0
	A+T		***NO MATCH***	0638	0025	3.92	0
	A-C		DMSO	0533	0030	5.63	0
	ACP	LI	AAF 800 UG/ML	0606	0064	10.56	0
	ACP	LU	AAF 800 UG/ML	0643	0036	5.60	0
	ACP	TE	AAF 800 UG/ML	0545	0045	8.26	0
977051174	ACT	LI1	0005-0 PCT.	0491	0026	5.30	2
977051174	ACT	LI2	0025-1 PCT.	0538	0030	5.58	0
977051174	ACT	LU1	0005-0 PCT.	0405	0018	4.44	0
977051174	ACT	LU2	0025-1 PCT.	0440	0034	7.73	2
977051174	ACT	TE1	0005-0 PCT.	0477	0025	5.24	2
977051174	ACT	TE2	0025-1 PCT.	0505	0023	4.55	0





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REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 510001 DETECTOR TA1538 SPECIES RHESUS/MONKEY DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPUL EP+6	MUT1 EP+0	FREQ1 EP-R	CONTAM
	A+C		AAF 800 UG/ML	0748	0078	10.43	0
	A+T		***NO MATCH***	0742	0043	5.80	2
	A-C		DMSO	0742	0020	2.70	2
	ACP	LI	AAF 800 UG/ML	0638	0348	54.55	0
	ACP	LU	AAF 800 UG/ML	0901	0047	5.22	0
	ACP	TE	AAF 800 UG/ML	0681	0045	6.61	0
977051174	ACT	LI1	0005-0 PCT.	0719	0026	3.62	0
977051174	ACT	LI2	0025-1 PCT.	0678	0054	7.96	0
977051174	ACT	LU1	0005-0 PCT.	0717	0025	3.49	2
977051174	ACT	LU2	0025-1 PCT.	0863	0026	3.01	2
977051174	ACT	TE1	0005-0 PCT.	0875	0042	4.80	2
977051174	ACT	TE2	0025-1 PCT.	0926	0032	3.46	0



BIONETICS

REPORT EXR33 LITTON BIONETICS MUTAGENIC ACTIVITY SYSTEM  
COMPOUND SUMMARY BACKUP DETAIL

CONTRACT 22374-2104 PROJECT 02468  
EXPERIMENT 514202 DETECTOR 0000D4 SPECIES RHESUS/MONKEY

DATE - 07/08/75

COMPOUND	TEST	ORG ID	CONCENTRATION	POPU EP+4	MUT1 EP+1	MUT2 EP+1	FREQ1 EP-5	FREQ2 EP-5	CONTAM
	A+C		DMN 90 UM/ML	0658	0012	0012	1.82	1.82	1
	A+T		***NO MATCH***	0695	0018	0019	2.59	2.73	1
	A-C		SALINE	0555	0012	0010	2.16	1.80	7
	ACP	LI	DMN 90 UM/ML	0799	0051	0030	6.38	3.75	0
	ACP	LU	DMN 90 UM/ML	0832	0020	0022	2.40	2.64	1
	ACP	TE	DMN 90 UM/ML	0739	0040	0017	5.41	2.30	4
977051174	ACT	LI1	0005-0 PCT.	0475	0015	0018	3.16	3.79	1
977051174	ACT	LI2	0025-1 PCT.	0455	0009	0012	1.98	2.64	0
977051174	ACT	LU1	0005-0 PCT.	0674	0012	0015	1.78	2.23	0
977051174	ACT	LU2	0025-1 PCT.	0714	0017	0010	2.38	1.40	0
977051174	ACT	TE1	0005-0 PCT.	0650	0014	0017	2.15	2.62	0
977051174	ACT	TE2	0025-1 PCT.	0550	0032	0009	5.82	1.64	0